

## Sewage Monitors

Under the Clean Water Act of 1972, the Congress mandated that every major U.S. municipality must determine how much wastewater it is processing and, more importantly, how much is going unprocessed into lakes and streams, either because of leaks in the sewer system or because the city's sewage facilities were getting more sewer flow than they were designed to handle. This prompted development, by American Digital Systems (ADS), Huntsville, Alabama, of the Quadrascan Flow Monitoring System, which met the need for an accurate method of data collection. The system consists of a series of monitoring sensors and microcomputers—typically 50 to 100—that continually measure water depth at particular sewer locations and report their findings to a central computer. This provides precise information to city managers on overall flow, flow in any section of the city, location and severity of leaks, and warning of potential overload. The system quickly gained wide acceptance.

The technology that enabled sensors and microcomputers to work reliably in the harsh environment of a sewer, subjected to slime, toxic gases and rank humidity, found a related application. Sewage treatment plant operators suggested that ADS sensors might be the answer to their problems of failed equipment, erroneous readings and clogged metering points due to the sewage environment. ADS responded with the Quadrascan 4000 Instrumentation/Process Control system which, like the sewer monitor, borrows the space technology of multiple redundancy—in this case four sensors at any one location—as a safeguard against failure or inaccuracy of any one sensor. In sewage treatment, the system's

sensors measure such factors as the level in a tank, the pressure in a pipe, the temperature in a vat, the amount of contaminant in a solution and report continuously to a central computer. A quadredundant sensor package is shown below being checked out by ADS engineers. The new system has been installed in sewage treatment plants at Orlando, Florida; Houston, Texas; and Lorain, Ohio. Although initially designed for sewage treatment monitoring, it is applicable to a wide variety of industrial processes wherein key operations must be monitored and controlled.

ADS monitors represent an example of the personnel-type technology transfer, in which aerospace personnel move to other industries

and apply their aerospace acquired skills to non-aerospace applications. The monitors were invented by Peter Petroff, who worked as an instrumentation designer at NASA's Marshall Space Flight Center and as an electronics specialist with aerospace companies producing missiles, satellites and commercial aircraft. In addition to the technique of quadredundancy, Petroff applied to development of his systems electronic circuitry and data collection expertise he acquired during the Apollo program and data acquisition expertise derived from his work on NASA satellites. Petroff founded ADS as a garage industry in 1975 and since then his innovative products have been installed in more than 2,000 cities. ▲

